Canal Seepage Groundwater Recharge 2011 Demonstration Projects

Platte Basin-Wide IMP Meeting
June 21, 2012

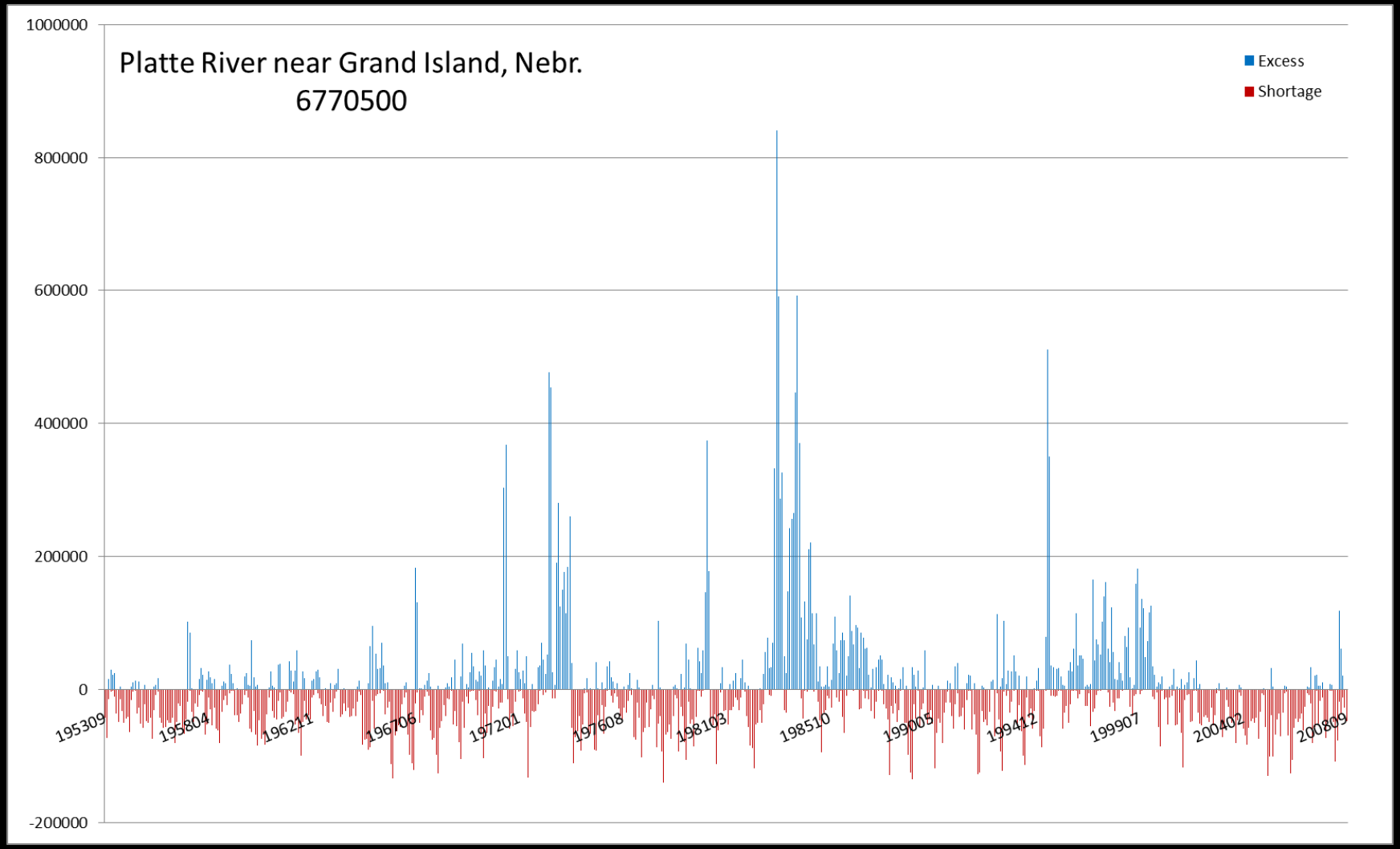
Pat Goltl

Integrated Water Management Division
Nebraska Department of Natural Resources

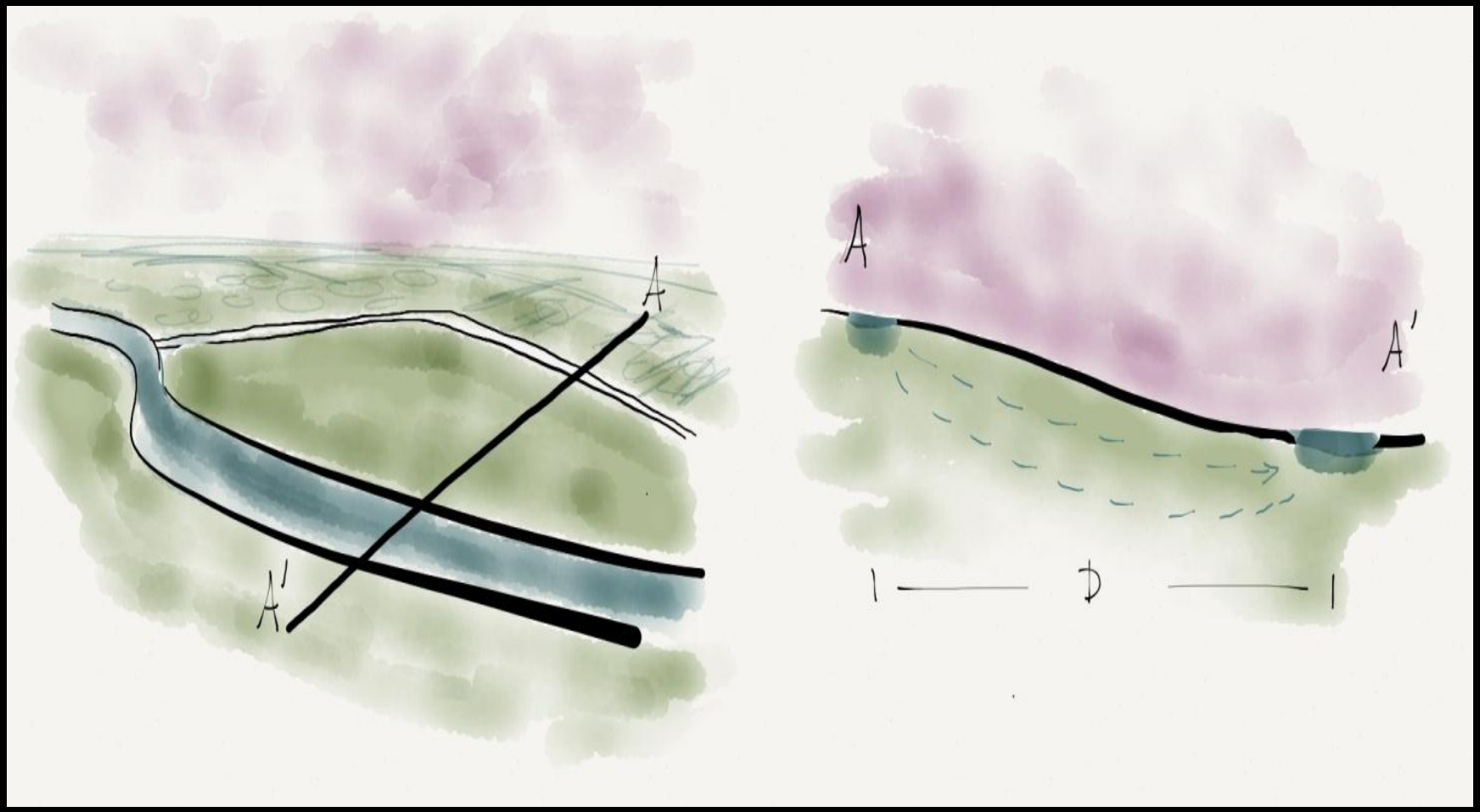
Summary

- **Divert streamflow in excess of PRRIP target flows to seep into groundwater**
  - Platte River
  - North Platte River
  - South Platte River
- **Divert the water into existing infrastructure**
  - Canals
  - Laterals
  - Ponds
- **Divert water before and after normal irrigation season diversions**

Example: Excess flows



Groundwater Storage and Return



Partners

- **20 Irrigation Districts and Canal Companies**
- **23 Canals**
- **1 Pond System** (9 ponds under Western Canal)
- **5 Platte NRDs**
  - Central Platte
  - North Platte
  - South Platte
  - Tri-Basin
  - Twin Platte
- **DNR**
- **PBHEP**

Participating Canals

	Irrigation District or Company	Canal
1	Bridgeport Irrigation District	Belmont Canal
2	Castle Rock Irrigation District	Castle Rock Canal
3	Central Irrigation District	Central Canal
4	Central Nebraska Public Power & Irrigation District	Phelps Canal
5	Chimney Rock Irrigation District	Chimney Rock Canal
6	Cozad Canal Company	Cozad Canal
7	Enterprise Irrigation District	Enterprise Canal
8	Farmers Irrigation District	Tri-State Canal
9	Keith Lincoln County Irrigation District	Keith-Lincoln Canal
10	Lisco Irrigation District	Lisco Canal
11	Minatare Canal Company	Minatare Canal
12	Nebraska Public Power District	Dawson Canal
13	Nebraska Public Power District	Gothenberg Canal
14	Nebraska Public Power District	Kearney Canal
15	Nine Mile Irrigation District	Nine Mile Canal
16	Pathfinder Irrigation District	Interstate Canal
17	Paxton-Hershey Water Company	Paxton-Hershey Canal
18	Platte Valley Irrigation District	North Platte Canal
19	South Side Irrigation Company	Orchard Alfalfa Canal
20	Suburban Irrigation District	Suburban Canal
21	Thirty Mile Canal Company	Thirty Mile Canal
22	Western Irrigation District	Western Canal
23	Western Irrigation District	Western Canal Ponds
24	Winters Creek Canal Company	Winters Creek Canal

Method

- **Canal Diversions**
  - Before and after irrigation season
  - According to DNR surface water permits
- **Calculate Amount of Water Entering Canals**
  - Average daily diversions to calculate water entering canals
    - Spring - for 30 days
    - Fall - after irrigation season until diversion stopped, ≥ 30 days

Estimate Canal Seepage

- **Water Balance Method**
  - Discharge measurements at spill locations of canals
  - Water balance calculations used to determine percentage of total diversion that was "lost"

Calculations:

1) Average Daily Diversion –Measured Spill = Canal Loss
2) Canal Loss ÷ Average Daily Diversion = Average Loss

(where average loss = a proportion of total water volume diverted)

- **OR from Modeling**
  - From STELLA model under COHYST 2010 project
  - Calculated at 32% of total canal diversion

Compare Estimates & Calculated Losses

- To historical seepage measurements and operational efficiencies if available

CNPPID Phelps Canal

Lori Potter, Kearney Hub | Posted: Tuesday, June 5, 2012 1:01 pm

http://www.kearneyhub.com/news/local/cnppid-officials-water-users-still-await-details-on-proposal-that/article_561f6a78-af38-11e1-acfe-0019bb2963f4.html

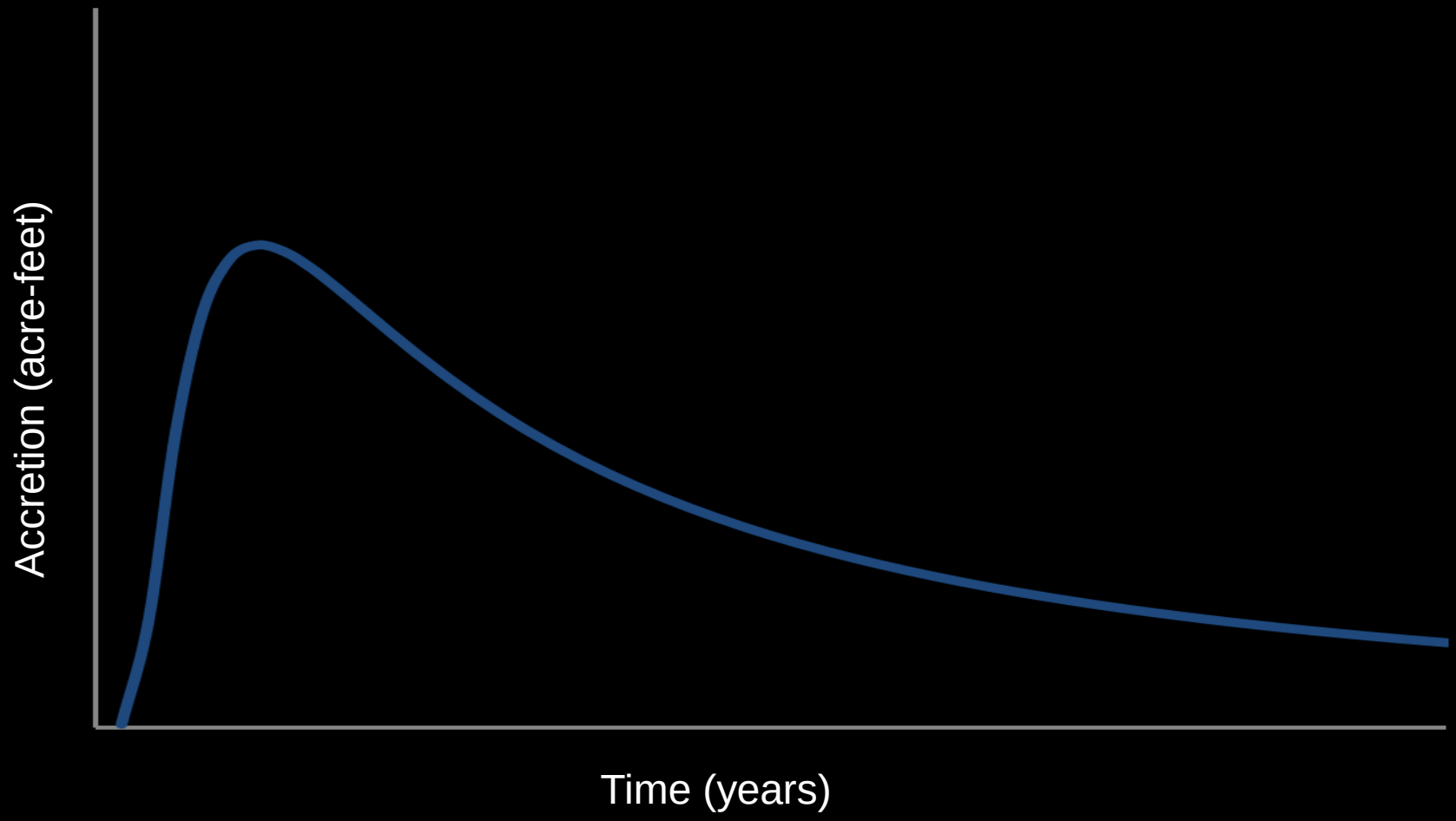
Canal Loss Calculation Method

	Irrigation District or Company	Canal	Method	Days Diverted	
				Spring	Fall
1	Bridgeport Irrigation District	Belmont Canal	Seepage Runs	30	70
2	Castle Rock Irrigation District	Castle Rock Canal	Measurement	30	73
3	Central Irrigation District	Central Canal	Measurement	30	58
4	Central Nebraska Public Power & Irrigation District	Phelps Canal	Measurement	0	100
5	Chimney Rock Irrigation District	Chimney Rock Canal	Measurement	30	70
6	Cozad Canal Company	Cozad Canal	Model	30	40
7	Enterprise Irrigation District	Enterprise Canal	Measurement	30	0
8	Farmers Irrigation District	Tri-State Canal	Measurement	30	0
9	Keith Lincoln County Irrigation District	Keith-Lincoln Canal	Measurement	30	57
10	Lisco Irrigation District	Lisco Canal	Measurement	30	53
11	Minatare Canal Company	Minatare Canal	Measurement	30	63
12	Nebraska Public Power District	Dawson Canal	Model	30	43
13	Nebraska Public Power District	Gothenberg Canal	Model	30	43
14	Nebraska Public Power District	Kearney Canal	Model	30	58
15	Nine Mile Irrigation District	Nine Mile Canal	Measurement	30	54
16	Pathfinder Irrigation District	Interstate	Measurement	15	0
17	Paxton-Hershey Water Company	Paxton-Hershey Canal	Model	30	61
18	Platte Valley Irrigation District	North Platte Canal	Model	30	56
19	South Side Irrigation Company	Orchard Alfalfa Canal	Model	30	42
20	Suburban Irrigation District	Suburban Canal	Measurement	30	47
21	Thirty Mile Canal Company	Thirty Mile Canal	Model	30	33
22	Western Irrigation District	Western Canal	Measurement	30	75
23	Western Irrigation District	Western Canal Ponds	Measurement	41	49
24	Winters Creek Canal Company	Winters Creek Canal	Measurement	0	68

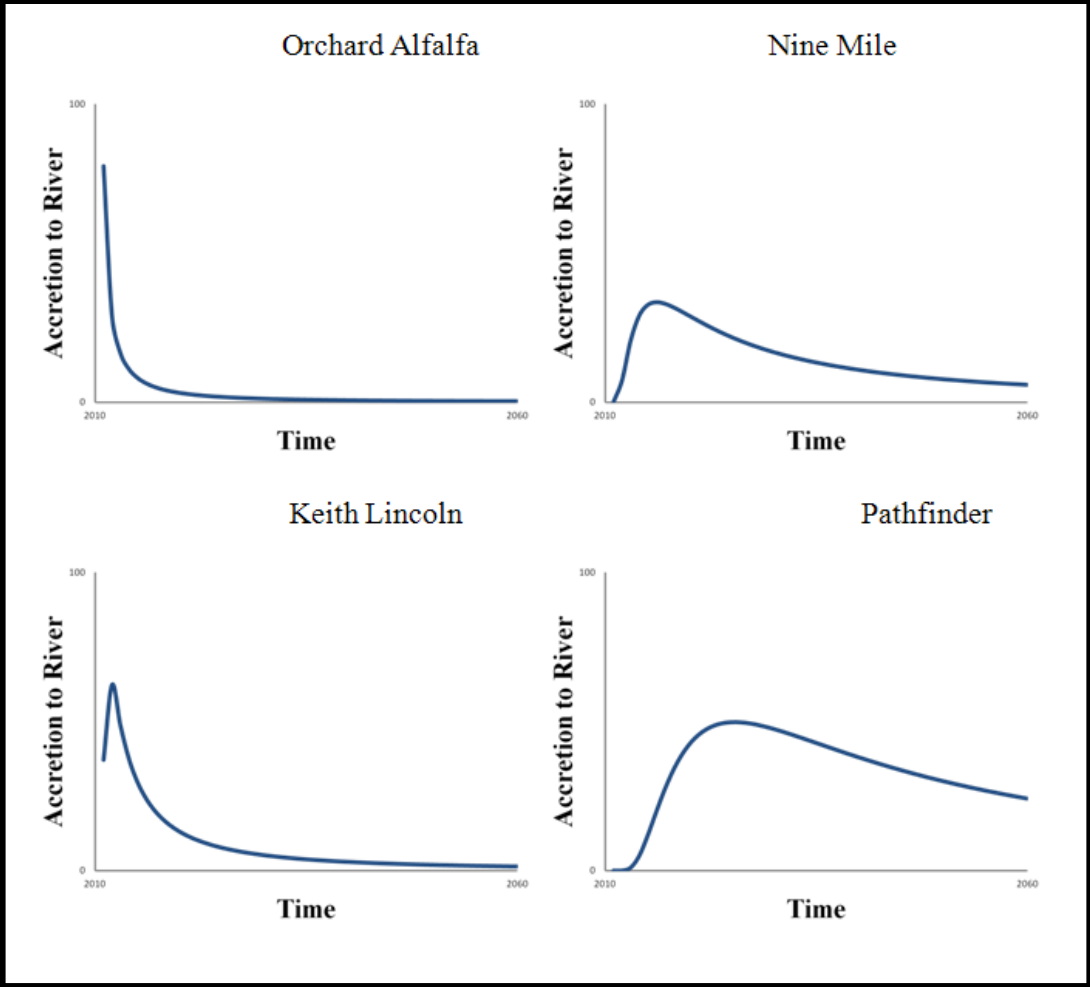
Response to Streamflow in Platte River

- **Estimate Seepage and Combine with Depletion Functions**
- **Depletion functions**
  - Developed by the POAC technical committee of PBHEP
    - Defined for 6 zones within each NRD
- **Response Function**
  - Accretion function developed to represent recharge in a single year
  - Used to estimate Platte River accretions for the next 50 years

Return Flow Accretion



Different Canal Responses



Accretions from 2011 Recharge Projects (ac-ft)

Year	Depletion	Accretion	Net Effect
2011		1539	1539
2012		2717	2717
2013		2871	2871
2014		2766	2766
2015		2579	2579
2016		2378	2378
2017		2189	2189
2018		2017	2017
2019		1863	1863

Project Summary

Diversion	200,000 ac-ft
Seepage	90,000 ac-ft
2011-2019 Accretions	21,000 ac-ft
Average annual Accretion (through 2019)	2,300 ac-ft
Accretions through 2060	50,000 ac-ft

Pat Goltl

Integrated Water Management Division

Nebraska Department of Natural Resources